

Application No. 09/686,500

Reply to Office Action

**REMARKS/ARGUMENTS*****The Pending Claims and the Present Invention***

Claims 1-17 are pending in the application and are directed to a floor coating composition (claims 1-14) and a coating composition-coated material (claims 15-17).

***Amendments to the Claims***

Claim 1 has been amended so as to more particularly point out and distinctly claim the invention. In particular, claim 1 has been amended to make it more clear how the poly(alkyleneoxy) group is derived. This amendment is supported by the specification at, for example, page 8, lines 11-22. No new matter has been added by way of this amendment.

***Summary of the Office Action***

Claims 1-11 and 14 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over GB Patent 2,307,912 (Rosenberry et al.). Claims 1-11 and 14 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent 6,596,445 (Matsumoto et al.). The Office Action also has rejected claims 12 and 13 under 35 U.S.C. § 103(a) as allegedly obvious over either Rosenberry et al. or Matsumoto et al. in view of the English abstract of JP 54041938 (Kazuhiko et al.) or U.S. Patent 6,345,835 (Klein et al.). Reconsideration of the pending claims is hereby requested.

***Discussion of the Restriction Requirement***

It is noted that the Office Action does not acknowledge Applicants' election, with traverse, of claims 1-14 (drawn to a floor coating composition) as detailed in the "Response to Office Action" dated April 12, 2005. Instead, the Office Action merely indicates that claims 15-17 (drawn to a material coated with the floor coating composition) have been withdrawn from consideration, without reconsideration of the restriction requirement. According to the M.P.E.P. (Section 821.01), the Examiner is required to reply to the arguments put forth in the traversal and is required to either withdraw the restriction or

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maintain the restriction by making it "final." As a result, Applicants have not indicated claims 15-17 as withdrawn.

*Characteristics of the Present Invention*

The floor coating composition of the present invention has the following characteristics (a) - (c).

- (a) The composition comprises an unsaturated urethane compound having a poly(alkyleneoxy) group  $(-(-RO)_n-)$ .
- (b) The unsaturated urethane compound is obtained from an isocyanate compound and a hydroxyl compound (at least one of these comprises a compound having an unsaturated bond) as starting materials, and the content of poly(alkyleneoxy) group  $(-(-RO)_n-)$  is 2-16 wt% of the total amount of the isocyanate compound and the hydroxyl compound.
- (c) The unsaturated urethane compound has the number of functional groups of 6 or more.

As used herein, the term "number of functional groups" means "a value obtained by multiplying the number of moles of each starting material having the unsaturated bond(s) by the number of the unsaturated bond(s) thereof, adding up the obtained values of the starting materials, dividing the resulting value by the total of the number of moles of the starting materials having the unsaturated bond(s) and multiplying the obtained value by the number of isocyanato group of the isocyanate compound(s)" of condition (2) of claim 1.

Having the above-mentioned characteristics (a)-(c), a floor coating film can be formed that has an extremely strong resistance to staining by contaminants and extremely high gloss retention. These properties permit the easy removal of flaws and color staining.

*Discussion of the Anticipation and Obviousness Rejections of Claims 1-11 and 14*

(A) *Rosenberry et al.*

Claims 1-11 and 14 allegedly are anticipated by or, in the alternative, obvious over Rosenberry et al. The Office Action contends that Rosenberry et al. discloses multifunctional

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unsaturated polyurethane (meth)acrylate oligomer floor coating compositions which anticipate the rejected claims (see the abstract, page 11, Formula 3, the examples, and the claims). According to the Office Action, it is not completely clear if the composition disclosed in Rosenberry et al. meets all of the parameters of the pending claims of the present application. However, the Office Action alleges that it would have been obvious to one of ordinary skill in the art to use the disclosure of Rosenberry et al. to make the floor coating composition as defined by claims 1-11 and 14.

The embodiments of the floor coating composition disclosed in Rosenberry et al. are the following (i) - (iii).

- (i) a coating composition (claim 1) comprising a compound containing a structural unit derived from polyisocyanate having at least 2 or 3 isocyanate groups, a structural unit derived from polyester polyol, and a structural unit derived from hydroxyalkyl(meth)acrylate having a molecular weight of 116-600 g/mol,
- (ii) a coating composition (claim 5) comprising a reaction product of polyisocyanate having 3 to 6 isocyanate groups (functional groups) per one molecule, aromatic polyester polyol, and hydroxyalkyl(meth)acrylate having an average molecular weight of 344-472 g/mol, and
- (iii) a coating composition comprising multifunctional polyurethane(meth)acrylate and a (meth)acrylate reactive diluent having a molecular weight of 200-2000 (page 2, line 6 from the bottom, through page 5, line 3, and claim 14).

As mentioned above, the floor coating composition of the present invention comprises an unsaturated urethane compound having a poly(alkyleneoxy) group  $(-\text{RO})_n-$ . In comparison, the floor coating compositions of (i) and (ii) of Rosenberry et al. are similar to the coating composition of the present invention in that they contain a reaction product (namely, an unsaturated urethane compound) of the starting materials comprising polyisocyanate (i.e., an isocyanate compound) and hydroxyalkyl(meth)acrylate (i.e., a hydroxyl compound); however, the unsaturated urethane compound does not have a poly(alkyleneoxy) group  $(-\text{RO})_n-$ . Thus, the compositions of (i) and (ii) of Rosenberry et al. are not encompassed by claims 1-11 and 14.

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Applicants note that (meth)acrylate of Formula 3, as pointed out in the Office Action, has a poly(alkyleneoxy) group, but it is a reactive diluent (page 11, lines 1-21) added to an unsaturated urethane compound for the purpose of decreasing the viscosity of the coating composition and is *not* a structural unit (i.e., starting material) of the unsaturated urethane compound of Rosenberry et al. Claim 1 has been amended to make it more clear that the poly(alkyleneoxy) group is derived from the isocyanate compound and/or hydroxyl compound.

The floor coating composition of (iii) of Rosenberry et al. comprises multifunctional polyurethane(meth)acrylate that is an unsaturated urethane compound comprising a structure of Formula 1. Applicants note that Formula 1 shows a structural unit comprising an alkyleneoxy group (-RO-), but does not show a poly(alkyleneoxy) group (-(-RO)<sub>n</sub>-). Therefore, the coating composition of (iii) of Rosenberry et al. is not the same as the coating composition of the present invention.

Furthermore, in the floor coating composition of (iii) of Rosenberry et al., the content of the alkyleneoxy group (-RO-) in the unsaturated urethane compound is 22-41 wt%. These values vastly exceed the claimed content of 2-16 wt% of the poly(alkyleneoxy) group (-(-RO)<sub>n</sub>-) in the unsaturated urethane compound used in the inventive coating composition. The content of the alkyleneoxy group (-RO-) in the unsaturated urethane compound represented by Formula 1 in the coating composition of (iii) of Rosenberry et al. was calculated by the following method. In Formula 1, R is isocyanurate, p is 1 or 3, R'' is hydrogen, R''' is -(CH<sub>2</sub>)<sub>6</sub>- (the smallest molecular weight) or -C<sub>6</sub>H<sub>4</sub>-CH<sub>2</sub>-C<sub>6</sub>H<sub>4</sub>- (the largest molecular weight), and m is 0 or 2. Embodiments in which R''' is -(CH<sub>2</sub>)<sub>6</sub>- (the smallest molecular weight) and -C<sub>6</sub>H<sub>4</sub>-CH<sub>2</sub>-C<sub>6</sub>H<sub>4</sub>- (the largest molecular weight) were separately calculated.

(a) R''' is -(CH<sub>2</sub>)<sub>6</sub>-

(a-1-1): p = 1 and m = 0

total amount of (CH<sub>2</sub>)<sub>6</sub>O/total molecular weight = 1110/4084 = 27%

(a-1-2): p = 1 and m = 2

total amount of (CH<sub>2</sub>)<sub>6</sub>O/total molecular weight = 1910/6088 = 32%

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(a-2-1):  $p = 3$  and  $m = 0$ total amount of  $(CH_2)_6O$ /total molecular weight =  $2314/5680 = 41\%$ (a-2-2):  $p = 3$  and  $m = 2$ total amount of  $(CH_2)_6O$ /total molecular weight =  $3114/7664 = 41\%$ (b)  $R'''$  is  $-C_6H_4-CH_2-C_6H_4-$ (b-1-1):  $p = 1$  and  $m = 0$ total amount of  $(CH_2)_6O$ /total molecular weight =  $1110/5068 = 22\%$ (b-1-2):  $p = 1$  and  $m = 2$ total amount of  $(CH_2)_6O$ /total molecular weight =  $1910/7052 = 27\%$ (b-2-1):  $p = 3$  and  $m = 0$ total amount of  $(CH_2)_6O$ /total molecular weight =  $2314/6664 = 35\%$ (b-2-2):  $p = 3$  and  $m = 2$ total amount of  $(CH_2)_6O$ /total molecular weight =  $3114/8648 = 36\%$ 

Thus, based on the foregoing calculations, it can be seen that Rosenberry et al. describes an alkyleneoxy content of 22-41% in the composition of (iii).

The inventive coating composition containing an unsaturated urethane compound containing 2-16 wt% of a poly(alkyleneoxy) group has superior gloss retention and resistance to staining. In addition, the inventive coating composition can form a floor coating film that is free from cracks and warping and has superior film properties, as shown in Examples 1-10 of the present application. While the unsaturated urethane compound having an alkyleneoxy group (-RO-) in the coating composition of (iii) of Rosenberry et al. is structurally similar to the unsaturated urethane compound having a *poly*(alkyleneoxy) group (-(-RO-)<sub>n</sub>-) in the inventive coating composition, the unsaturated urethane compound of (iii) contains an alkyleneoxy group (-RO-) in a proportion of 22-41 wt%. A coating composition containing an unsaturated urethane compound containing such a large amount of the alkyleneoxy group (-RO-) does not provide superior resistance to staining with aqueous ink and caustic soda. See, for example, the compositions of Reference Examples 1-6 in the present specification, which comprise an unsaturated urethane compound having a poly(alkyleneoxy) group (-(-RO-)<sub>n</sub>-) content exceeding 16 wt%. In addition, a coating composition containing an unsaturated urethane compound having a structural unit consisting of polyester polyol, such as the coating compositions of (i) and (ii) of Rosenberry et al., tends to get hydrolyzed

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because the unsaturated urethane compound contains an ester group. It is assumed, therefore, that a coating film obtained therefrom does not have superior resistance to staining with aqueous ink and caustic soda.

Furthermore, the (meth)acrylate of Formula 3 (a reactive diluent) of Rosenberry et al. has a poly(alkyleneoxy) group  $(-\text{RO}-)_n-$ , and a coating film obtained therefrom would incorporate a poly(alkyleneoxy) group  $(-\text{RO}-)_n-$ . However, even if the (meth)acrylate of Formula 3 (a reactive diluent) is added to the above-mentioned coating compositions (i) and (ii) of Rosenberry et al., the problem of superior resistance of the coating film to staining with aqueous ink and caustic soda cannot be improved because the unsaturated urethane compound contains an ester group. If the (meth)acrylate of Formula 3 (a reactive diluent) is added to the above-mentioned coating composition (iii), the amount of  $-\text{RO}-$  would further increase. As a result, the resistance of the coating film to staining with aqueous ink and caustic soda likely would further decrease.

Accordingly, the unsaturated urethane compound of the coating composition of the present invention differs from the unsaturated urethane compound disclosed by Rosenberry et al. As a result, the coating composition defined by claims 1-11 and 14 is not anticipated by Rosenberry et al.

The coating composition of claims 1-11 and 14 also is not obvious in view of Rosenberry et al. As discussed above, Rosenberry et al. does not describe a floor coating composition containing an unsaturated urethane compound having a *poly(alkyleneoxy)* group derived from the isocyanate compound and/or hydroxyl compound. As a result, the coating composition of the present invention is not taught by Rosenberry et al. In addition, Rosenberry et al. does not recognize the relationship between the content of the *poly(alkyleneoxy)* group in the unsaturated urethane compound and the properties of the coating film (cured film) obtained using the coating composition. Rosenberry et al. fails to teach or suggest the modification of the composition disclosed therein in the manner necessary to arrive at the present invention. Therefore, the coating composition of claims 1-11 and 14 is not obvious in view of Rosenberry et al.

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Based on the foregoing, the coating composition of claims 1-11 and 14 is novel and unobvious in view of the disclosure of Rosenberry et al., and the rejections based on Rosenberry et al. should be withdrawn.

*(B) Matsumoto et al.*

Claims 1-11 and 14 allegedly are anticipated by or, in the alternative, obvious over Matsumoto et al. According to the Office Action, Matsumoto et al. teaches O-acyloxime photoinitiators that may be present in floor coating compositions (see col. 31, lines 31-54, and col. 36, lines 39-57). Again the Office Action alleges that it is not completely clear if Matsumoto et al. directly teaches a floor coating composition that meets all of the parameters of the pending claims of the present application. However, the Office Action alleges that it would have been obvious to one of ordinary skill in the art to use the disclosure of Matsumoto et al. to make the floor coating composition as defined by the pending claims.

As pointed out by the Examiner, Matsumoto et al. describes an unsaturated urethane compound, which is a reaction product of a hydroxyl compound and an isocyanate (col. 31, lines 46-55). However, the unsaturated urethane compound described by Matsumoto et al. is a reaction product of a monofunctional acrylate and a bifunctional isocyanate. The resulting bifunctional unsaturated urethane compound has only 2 functional groups. In addition, Matsumoto et al. does not describe any compounds having a poly(alkyleneoxy) group, and, thus, the unsaturated urethane compound does not comprise a poly(alkyleneoxy) group. In contrast, the unsaturated urethane compound in the inventive coating composition is an unsaturated urethane compound having not less than 6 as the number of functional groups (see condition (2) of claim 1) and contains a poly(alkyleneoxy) group. Therefore, the coating composition of pending claims 1-11 and 14 is not anticipated by Matsumoto et al.

In addition, the present invention is not obvious in view of the disclosure of Matsumoto et al. The unsaturated urethane compound described in Matsumoto et al. does not have a poly(alkyleneoxy) group and has a smaller number of functional groups than does the unsaturated urethane compound used in the present invention. Based on the teachings of Matsumoto et al., one of ordinary skill in the art would not be led to prepare the coating composition of the present invention nor realize the benefits expected therefrom. Thus, the

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coating composition of pending claims 1-11 and 14 is not obvious in view of Matsumoto et al.

Based on the foregoing, the coating composition of claims 1-11 and 14 is novel and unobvious in view of the disclosure of Matsumoto et al., and the rejections based on Matsumoto et al. should be withdrawn.

*Discussion of the Obviousness Rejection of Claims 12 and 13*

The Office Action also has rejected claims 12 and 13 under 35 U.S.C. § 103(a) as allegedly obvious over either Rosenberry et al. or Matsumoto et al. in view of the English abstract of JP 54041938 (Kazuhiko et al.) or U.S. Patent 6,345,835 (Klein et al.). The Office Action acknowledges that Rosenberry et al. and Matsumoto et al. fail to teach the addition of a poly(alkyleneoxy) group-containing epoxy resin. The Examiner alleges that it would have been obvious to one of ordinary skill in the art to use the disclosure of either Kazuhiko et al. or Klein et al. as motivation to add an epoxy group to the coating compositions taught by the Rosenberry et al. and Matsumoto et al.

Klein et al. and Kazuhiko et al. describe an epoxy resin having a poly(alkyleneoxy) group. Claims 12 and 13 of the present invention recite the addition of an epoxy resin having a poly(alkyleneoxy) group to the coating composition of claim 1, which contains an unsaturated urethane compound having a poly(alkyleneoxy) group content of 2-16 wt% and 6 or more functional groups. As discussed above, however, the coating compositions disclosed in Rosenberry et al. or Matsumoto et al. are different than the present invention as defined by the pending claims, and Klein et al. and Kazuhiko et al. do not teach or suggest the elements missing from Rosenberry et al. and/or Matsumoto et al. Therefore, even if, for the sake of argument, one of ordinary skill in the art combined the teachings of the cited references, one of ordinary skill in the art still would not arrive at the inventive coating composition, which contains an unsaturated urethane compound having a poly(alkyleneoxy) group content of 2-16 wt% and 6 or more functional groups.

In view of the foregoing, the obviousness rejection of claims 12 and 13 should be withdrawn.

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*Conclusion*

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

  
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Date: October 11, 2005